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### **REMARKS**

This amendment is responsive to the official action dated June 13, 2003.

Claims 22-39 were pending in the application. Claims 22-39 were rejected. No claims were allowed by the Examiner.

By way of this amendment, the Applicant has amended Claim 22. Claims 36-39 have been canceled.

Accordingly, Claims 22-35 are currently pending.

#### **I. DOUBLE PATENTING**

The Examiner rejected Claims 22-29, 31 and 33-34 of the present application under the judicially created doctrine of obviousness-type double patenting as being unpatentable over Claims 1-18 of US Patent No. 6,392,256. The Examiner stated that with respect to Claim 22 of the present application, the claims of the '256 patent discloses an optical transmitter and receiver pair having a semiconductor substrate, an optical transmitter formed on the substrate, an optical receiver formed adjacent to the optical transmitter and an isolation area. However, the claims in the '256 patent are directed to one embodiment of the invention wherein a substrate is provided wherein a VCSEL (optical transmitter) structure is formed over the entire surface of the substrate. The optical receiver portion is then formed on top of the VCSEL layers. To prevent interference between the bottom layers of the VCSEL and the optical receiver layers formed thereon, a proton injection region is introduced into the VCSEL around the photo receiver to render the underlying VCSEL layers inactive, thereby preventing electrical interference between the two devices. In the '256 patent the claimed structure is clearly a stacked arrangement.

After a complete review of Claim 1 in the '256 patent it is clear that the claim provides for the following discrete and separate elements a multi layer VCSEL structure formed on the substrate with no limitations as created by the Examiner, photo diodes formed on the VCSEL structure at discrete locations *on the VCSEL in a stacked arrangement*. The proton implant layers then must be added to prevent the VCSEL structure underlying the photo diodes from activation and interfering with the photo diodes. This construction is clear and well defined within the claim limitations of the '256

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patent. Each element of the claims must be read in relation to one another with regard for proper claim construction and interpretation. It is clear from this comparison that the claims of the present application and the claims of the '256 patent are directed to two distinctly different constructions. As a result, the claims of the present application as amended are directed to an invention that is patentably distinct from the invention disclosed in the '256 patent.

The present application is directed to a substrate having an optical transmitter structure (VCSEL) formed on a portion thereof and an optical receiver formed laterally adjacent to (beside) the VCSEL not on top as in the '256 patent. Further, Claim 22 includes a limitation that the VCSEL and optical receiver be optically isolated from one another. It is clear in Claim 22, as amended, that the present invention is not directed to a stacked configuration. The distinction can be seen by comparing Figs. 3 and 5. The claims in the present invention are directed to the embodiment shown in Fig. 3 where a substrate 60 is provided on which a VCSEL 89 is formed in one area and a photo receiver 62 is formed in another adjacent area. The isolation area 80 is provided to eliminate any electrical or potential optical interference from traveling through the substrate 60 and disrupting the photo receiver 62. In contrast, the claims in the '256 patent are directed to the embodiment in Fig. 5 where a substrate structure 78 is provided wherein the entire surface is coated with a built-up VCSEL layered construction 76. The photo detector region 90 is then applied on top of the VCSEL layers 76. Isolation areas 80 are then created by injecting a proton stream into the VCSEL layers 76 around the area upon which the photo detector 90 is constructed to selectively inactivate the VCSEL 76 in this area by preventing the flow of electricity. The additional drawback in the '256 invention is that the inactive VCSEL 76 may accidentally become activated and provide optical interference into the back of the photoreceiver 62. In order to prevent this a reverse pass diode must be formed in the structure of the VCSEL 76 below the photo receiver 62 to eliminate the potential of activation.

In the alternative, should the Examiner determine that there is insufficient structural differences between the invention of the present application and the invention disclosed in the '256 patent to warrant a patentable distinct embodiment, the Applicant will be willing to file a Terminal Disclaimer in addition to paying the appropriate fee if required.

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## II. REJECTION OF CLAIMS UNDER 35 USC 103

Claims 22-26, 28-29, 32 and 34-35 were rejected under 35 USC 103(a), as being unpatentable over US Patent No. 5,266,794 (Olbright et al.). The Examiner stated that with regard to Claim 22, Olbright discloses an integrated light emitting and photo detector device including a semiconductor substrate, an optical transmitter on the substrate and an optical receiver formed laterally adjacent to the optical transmitter. The device, however, as described in the disclosure, is formed to become a single switch module in a three dimensional switching array. Radiation from adjacent modules establishes connectivity between each module. The disclosure further states that the construction specifically provides for a linear, upward communication between the modules, from the front to the back in an HBT-up configuration. (Col 8, Lines 47-58). The photo detector section is formed to work in interlocked relation to the VCSEL section by communicating through the substrate and in particular by communicating through the semiconductor-substrate having logic etched thereon. The photo detector is specially formed to receive light signals from both the front and the back. In addition, the VCSEL includes a HBT/HPT photo detector base upon which it is built. In this manner, the construction allows the module to receive and process incoming signals from three different points. In response to this input, the module will then selectively repeat the incoming signal using the VCSEL portion of the module. It is a critical component of the disclosure that the photo detector and VCSEL be allowed to communicate. It is also clear from the disclosure that the photo detector and VCSEL sections must be separated by a relatively large distance to prevent interference between signals received at the rear of the photo detector and signals received at the rear of the VCSEL. If these two components were placed too closely on the substrate, cross talk and poor switching results would be produced. This disclosure is in direct contrast to the assertion made by the Examiner that the modules in the device are isolated from one another, an assertion that is false.

In contrast, the present invention specifically provides a critical electrical isolation region between the receiver and transmitter sections to electrically isolate them from one another. This isolation region is in the form of a proton injected area in the substrate that prevents electrical conductivity across the region. In this manner, while both the

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transmitter and receiver are mounted onto the same substrate, they are electrically isolated from one another allowing completely independent operation. This is the feature of the present invention that allows the module to be used for simultaneous TX/RX operations in the high-speed transfer of data over paired fiber runs. Further, this isolation area allows the transmitter and receiver to be formed more closely to one another on the substrate, while preventing cross talk and interference between the two parts of the module. This feature of the present invention is important to allow the module to be employed with dual mode fibers, where two fiber conductors, separated by only 250 microns, are bundled together into a single core and jacket. This close spacing between the transmitter and receiver was previously unattainable in the prior art.

Despite the attempts at hindsight reconstruction, since the present invention specifically recites subject matter that is not disclosed in Olbright, the rejection is not believed to be applicable. Specifically, since Olbright does not disclose the provision of electrical isolation between the transmitter and receiver sections of the module to allow independent operation of the two units, the disclosure in Olbright cannot render the disclosure in the present invention obvious. Therefore, reconsideration and withdrawal of this rejection is respectfully solicited.

### III. REJECTION OF CLAIMS UNDER 35 USC 103

Claims 30-31 were rejected under 35 USC 103(a) as being unpatentable over Olbright in view of US Patent No. 5,136,603 (Hasnain et al.). The Examiner has stated that as applied above Olbright discloses the present invention with the exception of an intrinsic layer in the photodiode to provide an improved PIN type diode that enhances the confinement of the carriers. The Examiner further stated that since Hasnain discloses the use of PIN type photo diodes, it would have been obvious to one skilled in the art to combine the references to render the present invention obvious.

As stated above, with respect to Olbright, the combination of these two references is devoid of any teaching regarding the isolation of the two components in the module. There is no teaching either alone or in combination of these cited references that provides for the placement in close proximity of the photodiode and VCSEL portions of the module through the use of a proton injected isolation region. While in view of the

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disclosure provided in the present invention it may be obvious to create this side-by-side construction utilizing isolation regions and a PIN type photo diode, the present reference is not available for citation against itself. Therefore, the Examiner is simply utilizing hindsight reconstruction to attempt to render the present invention obvious in view of its own disclosure.

While the use of an improved PIN type photo detector does allow the two components to be placed more closely to one another, without the required isolation area, the present invention would suffer from a high degree of cross talk and interference rendering it ineffective. Further, as stated earlier, the present invention provides for a side-by-side construction, not a stacked construction as provided in the cited references.

Since the references cited by the Examiner cannot be combined to arrive at the invention of the present application, is not believed that the present invention is rendered obvious in view of the combination. Therefore, the Applicant requests withdrawal of this rejection.

Claims 27-33 were rejected under 35 USC 103(a) as being unpatentable over Olbright in view of US Patent No. 5,498,883 (Lebby et al.). The Examiner has stated that as applied above Olbright discloses the present invention with the exception of cladding layers on the top and bottom of the active layer in the VCSEL to improve the confinement of the carriers. The Examiner further stated that since Lebby discloses the use of cladding and anti-reflective layers in VCSELS, it would have been obvious to one skilled in the art to combine the references to render the present invention obvious.

As stated above in the comments related to Olbright alone, the device in Olbright provides for a module that includes a photo detector and a VCSEL that are designed to work in conjunction with one another to receive and process signals from both the front and rear sides of the substrate that are then processed to activate the VCSEL to relay the signal as necessary. Should one skilled in the art apply the cladding layers described in Lebby to the Olbright disclosure, the present invention would still not be disclosed. The present invention includes specific isolation limitations that restrict both electrical and optical interference and eliminate cross-talk that are not disclosed in the cited prior art that allow the two elements, namely the transmitter and receiver, mounted in close proximity on the module to function entirely independent of one another. The

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Olbright devices are inextricably linked as provided in their own disclosure. If they were not, the device would not function.

Since the references cited by the Examiner cannot be combined to arrive at the invention of the present application, is not believed that the present invention is rendered obvious in view of the combination. Therefore, the Applicant requests withdrawal of this rejection.

Since the references cited by the Examiner cannot be combined to arrive at the invention of the present application, is not believed that the present invention is rendered obvious in view of the combination. Therefore, the Applicant requests withdrawal of these grounds for rejection.

#### IV. CONCLUSION

Accordingly, claims 22-35 are believed to be in condition for allowance and the application ready for issue.

Corresponding action is respectfully solicited.

PTO is authorized to charge any additional fees incurred as a result of the filing hereof or credit any overpayment to our account #02-0900.

Respectfully submitted,



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